INTERNATIONAL STANDARD 3727

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Butter — Determination of water, solids-not-fat and fat contents on the same test portion (Reference method)

Beurre — Détermination des teneurs en eau, en matière sèche non grasse et en matière grasse sur la même prise d'essai (Méthode de référence)

First edition — 1977-11-01

UDC 637.225 : 543.812/.814

Ref. No. ISO 3727-1977 (E)

Descriptors : food products, butter, chemical analysis, determination of content, water, dry matter, fats, test specimens.

Price based on 3 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3727 was developed by Technical Committee ISO/TC 34, *Agricultural food products*, and was circulated to the member bodies in February 1975.

It has been approved by the member bodies of the following countries :

Austria	Germany	Portugal
Belgium	Hungary	Romania
Brazil	India	South Africa, Rep. of
Bulgaria	Iran	Spain
Canada	Israel	Thailand
Chile	Mexico	Turkey
Czechoslovakia	Netherlands	United Kingdom
Ethiopia	New Zealand	Yugoslavia
France	Poland	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Ghana

NOTE — The method specified in this International Standard has been developed jointly with the IDF (International Dairy Federation) and the AOAC (Association of Official Analytical Chemists, U.S.A.) and is also included in the FAO/WHO Code of Principles concerning Milk and Milk Products and Associated Standards.

The text as approved by the above organizations is also being published by FAO/WHO (Code of Principles, Standard No. B 9), by the IDF and by the AOAC (Official Methods of Analysis).

Printed in Switzerland

Butter — Determination of water, solids-not-fat and fat contents on the same test portion (Reference method)

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a reference method for the determination of the water, solids-not-fat (including salt), and fat contents on the same test portion of butter.

2 REFERENCE

ISO/R 707, *Milk and milk products — Sampling.*

3 DEFINITIONS

3.1 water content of butter : The loss of mass, expressed as a percentage, as determined by the procedure specified.

3.2 solids-not-fat content of butter : The percentage by mass of substances as determined by the procedure specified.

3.3 fat content of butter : The percentage by mass obtained by subtracting the water content and the solids-not-fat content from 100.

4 PRINCIPLE

4.1 Determination of water content

Drying of a known mass of butter at 102 ± 2 °C and weighing to determine the loss of mass.

4.2 Determination of solids-not-fat content

Extraction of the fat from the dried butter (4.1) with light petroleum or *n*-hexane and weighing of the residue.

4.3 Determination of fat content

Calculation of the fat content by difference (see 3.3).

5 REAGENT

***n*-Hexane** or, alternatively, **light petroleum** (petroleum spirit) with any boiling range between 30 and 60 °C. The reagent shall not leave more than 1 mg of residue after evaporation of 100 ml.

6 APPARATUS

Usual laboratory equipment and in particular :

6.1 Analytical balance.

6.2 Drying oven, well ventilated and capable of being controlled at 102 ± 2 °C.

6.3 Dishes, of glass, porcelain or metal resistant to corrosion under the conditions of the test, at least 25 mm high and at least 50 mm in diameter.

6.4 Filter crucibles, sintered glass, porosity grade P 40 (pore diameters 16 to 40 μm), with suction flask.

6.5 Stirrer with end-piece of flexible, inert material.

6.6 Desiccator containing a suitable drying agent, for example silica gel containing an indicator.

7 SAMPLING

See ISO/R 707.

8 PROCEDURE

8.1 Preparation of the test sample

Warm the laboratory sample in the original unopened container, which should be from one-half to two-thirds full, to a temperature at which the sample will be soft enough to facilitate a thorough mixing to a homogeneous state (either by a mechanical shaker or by hand) without any rupture of emulsion. The temperature of mixing should normally not exceed 35 °C.

Cool the sample to ambient temperature, continuing to mix until cooling is completed. As soon as possible after cooling, open the sample container and stir briefly (not longer than 10 s) with a suitable device, for example a spoon or spatula, before weighing.

8.2 Determination of water content

8.2.1 Dry a dish (6.3) in the oven (6.2) at 102 ± 2 °C for at least 1 h.

8.2.2 Allow the dish to cool in the desiccator (6.6) to the temperature of the balance room and weigh to the nearest 0,1 mg.

8.2.3 Weigh in the dish, to the nearest 1 mg, a test portion of between 2 and 6 g of the test sample (8.1). (Test portions shall be between 5 and 6 g for unsalted butter.)

8.2.4 Place the dish in the oven at 102 ± 2 °C and leave it for 2 h.

8.2.5 Allow the dish to cool in the desiccator to the temperature of the balance room and weigh to the nearest 0,1 mg.

8.2.6 Repeat the drying process for 1 h and then for additional 30 min periods, cooling and weighing each time as specified in 8.2.5, until constant mass (mass change not exceeding 0,5 mg) is reached. In the event of an increase in mass, take for the calculation the lowest mass recorded.

8.3 Determination of solids-not-fat content

8.3.1 Dry a filter crucible (6.4) in the oven (6.2) at 102 ± 2 °C for at least 1 h.

8.3.2 Allow the crucible to cool in the desiccator (6.6) to the temperature of the balance room and weigh to the nearest 0,1 mg.

8.3.3 Add 10 to 15 ml of warm (see note) *n*-hexane or light petroleum (clause 5) to the dish containing the dry matter left from the water determination (8.2), to dissolve the fat.

NOTE – In the case of *n*-hexane or of light petroleum having an initial boiling point of 40 °C or above, use a temperature of 35 °C; in the case of light petroleum having an initial boiling point below 40 °C, use a temperature of 25 °C.

8.3.4 Detach as much as possible of the sediment adhering to the dish by using the stirrer (6.5), and transfer the contents quantitatively into the weighed crucible (8.3.2) with the aid of the stirrer tip.

8.3.5 Repeat operations 8.3.3 and 8.3.4 five times.

8.3.6 Wash the sediment in the crucible with 25 ml of warm (see note in 8.3.3) *n*-hexane or light petroleum (clause 5).

8.3.7 Dry the dish and crucible in the oven at 102 ± 2 °C for 30 min.

8.3.8 Allow the dish and crucible to cool in the desiccator to the temperature of the balance room and weigh to the nearest 0,1 mg.

8.3.9 Repeat operations 8.3.7 and 8.3.8 until constant mass (mass change not exceeding 0,5 mg) is reached.

8.4 Number of determinations

Carry out the procedure specified in 8.2 and 8.3 on duplicate test portions taken from the same prepared test sample.

9 EXPRESSION OF RESULTS

9.1 Method of calculation of water content

For each of the duplicate test portions, calculate the water content, E, as a percentage by mass, using the following formula :

$$E = \frac{m_1 - m_2}{m_1 - m_0} \times 100$$

where

m_0 is the mass, in grams, of the empty dish (8.2.2);

m_1 is the mass, in grams, of the test portion and dish before drying (8.2.3);

m_2 is the mass, in grams, of the test portion and dish after drying (8.2.6).

Provided that the requirement for repeatability (9.4.1) is satisfied, take as the result the arithmetic mean, $\bar{E}$, of the values obtained, expressed to the first decimal place.

9.2 Method of calculation of solids-not-fat content

For each of the duplicate test portions, calculate the solids-not-fat content, S, as a percentage by mass, using the following formula :

$$S = \frac{(m_4 - m_3) + (m_5 - m_0)}{m_1 - m_0} \times 100$$

where

m_0 and m_1 are as defined in 9.1;

m_3 is the mass, in grams, of the empty crucible (8.3.2);

m_4 is the mass, in grams, of the crucible containing sediment (8.3.9);

m_5 is the final mass, in grams, of the dish (8.3.9).

Provided that the requirement for repeatability (9.4.2) is satisfied, take as the result the arithmetic mean, $\bar{S}$, of the values obtained, expressed to the first decimal place.

9.3 Method of calculation of fat content

The percentage, by mass, of fat is equal to :

$$100 - (\bar{E} + \bar{S})$$

where

$\bar{E}$ is the percentage, by mass, of water (9.1);

$\bar{S}$ is the percentage, by mass, of solids-not-fat (9.2).

Express the result to the first decimal place.

9.4 Repeatability

9.4.1 *Water content*

The difference between the results of two determinations carried out simultaneously or in rapid succession by the same analyst shall not exceed 0,1 g of water per 100 g of the product.

9.4.2 *Solids-not-fat content*

The difference between the results of two determinations carried out simultaneously or in rapid succession by the same analyst shall not exceed 0,1 g of solids-not-fat per 100 g of the product.

10 TEST REPORT

The test report shall show the method used and the results obtained. It shall also mention any operating conditions not specified in this International Standard, or regarded as optional, as well as any circumstances that may have influenced the results.

The report shall include all details required for the complete identification of the sample.

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